CLAIMS

1. An optical pulse compressor comprising:

an optical Fourier transform circuit for converting the shape of the frequency spectrum of an input optical pulse to a time waveform, the optical Fourier transform circuit having an optical phase modulator driven at the repetition frequency of the input optical pulse train and a dispersive medium; and

an narrow-band optical filter for narrowing the spectrum width of the input optical pulse, the narrow-band optical filter being inserted before the optical Fourier transform circuit,

wherein the optical Fourier transform circuit converts an optical pulse having a narrow spectrum width output from the narrow-band optical filter to an optical pulse having a narrow time width.

2. An optical pulse compressor according to Claim 1, wherein a Fourier-transform-limited pulse is used as the input optical pulse.

3. An optical pulse compressor according to Claim 1, wherein the narrow-band optical filter has a variable spectrum band; and

the optical Fourier transform circuit implements pulse compression with a variable compression rate.

4. An optical pulse compressor according to Claim 1, wherein the optical phase modulator is driven at a clock frequency reproduced from the input optical pulse train, and linearly chirps the input optical pulse; and

the dispersive medium gives group velocity dispersion.

5. An optical pulse compressor according to Claim 1, wherein, in the optical Fourier transform circuit,

the dispersive medium gives group velocity dispersion to the optical pulse output from the narrow-band optical filter;

the optical phase modulator is driven at a clock frequency reproduced from the input optical pulse train, and linearly chirps the optical pulse output from the dispersive medium; and

the dispersive medium receives the optical pulse output from the optical phase modulator, gives group-velocity dispersion again, and compensates for the remaining chirp.

6. An optical pulse compressor according to Claim 1, wherein, in the optical Fourier transform circuit,

the optical phase modulator is driven at a clock frequency reproduced from the input optical pulse train, and linearly chirps the optical pulse output from the narrow-band optical filter;

the dispersive medium gives group-velocity dispersion to the optical pulse output from the optical phase modulator; and

the optical phase modulator receives the optical pulse output from the dispersive medium, gives another linear chirp, and compensates for the remaining chirp.

7. An optical pulse compressor according to Claim 1, wherein the chirp rate K of phase modulation by the phase modulator and the group-velocity dispersion D of the dispersive medium satisfy a relationship of $K = 1/D$.

8. An optical function generator comprising:

an optical pulse generator for generating an optical

pulse train;

an optical Fourier transform circuit for converting the shape of the frequency spectrum of the optical pulse input from the optical pulse generator to a time waveform, the optical Fourier transform circuit having an optical phase modulator driven at the repetition frequency of the input optical pulse train from the optical pulse generator and a dispersive medium; and

an optical filter for shaping the spectrum of the input optical pulse, the optical filter being inserted before the optical Fourier transform circuit,

wherein the optical Fourier transform circuit generates an optical pulse having a desired time waveform, by reproducing, directly in the time domain, the spectrum shaped as desired by the optical filter.

9. An optical function generator according to Claim 8, wherein a Fourier-transform-limited pulse is used as the input optical pulse.

10. An optical function generator according to Claim 8, wherein

the optical phase modulator is driven at a clock frequency reproduced from the input optical pulse train, and linearly chirps the input optical pulse; and

the dispersive medium gives group-velocity dispersion.

11. An optical function generator according to Claim 8, wherein, in the optical Fourier transform circuit,

the dispersive medium gives group-velocity dispersion to the optical pulse output from the optical filter;

the optical phase modulator is driven at a clock

frequency reproduced from the input optical pulse train, and linearly chirps the optical pulse output from the dispersive medium; and

the dispersive medium receives the optical pulse output from the optical phase modulator, gives group-velocity dispersion again, and compensates for the remaining chirp.

12. An optical function generator according to Claim 8, wherein, in the optical Fourier transform circuit,

the optical phase modulator is driven at a clock frequency reproduced from the input optical pulse train, and linearly chirps the optical pulse output from the optical filter;

the dispersive medium gives group-velocity dispersion to the optical pulse output from the optical phase modulator; and

the optical phase modulator receives the optical pulse output from the dispersive medium, gives another linear chirp, and compensates for the remaining chirp.

13. An optical function generator according to Claim 8, wherein the chirp rate K of phase modulation by the phase modulator and the group-velocity dispersion D of the dispersive medium satisfy a relationship of $K = 1/D$.

14. An optical pulse compression method using an optical pulse compressor comprising an optical Fourier transform circuit and a narrow-band optical filter, the optical Fourier transform circuit having an optical phase modulator and a dispersive medium, the optical pulse compression method comprising that:

narrowing the spectrum width of an input optical pulse by inserting the narrow-band optical filter before the optical

Fourier transform circuit;

driving the optical phase modulator at the repetition frequency of the input optical pulse train; and

converting the optical pulse having a narrow spectrum width output from the narrow-band optical filter to an optical pulse having a narrow time width, by means of the optical Fourier transform circuit.

15. An optical function generation method using an optical function generator comprising an optical pulse generator, an optical Fourier transform circuit, and an optical filter, the optical Fourier transform circuit having an optical phase modulator and a dispersive medium, the optical function generation method comprising that:

shaping the spectrum of an input optical pulse input from the optical pulse generator, by inserting the optical filter before the optical Fourier transform circuit;

driving the optical phase modulator at the repetition frequency of the input optical pulse train; and

generating an optical pulse having a desired time waveform, by reproducing, directly in the time domain, the spectrum shaped as desired by the optical filter, by means of the optical Fourier transform circuit.